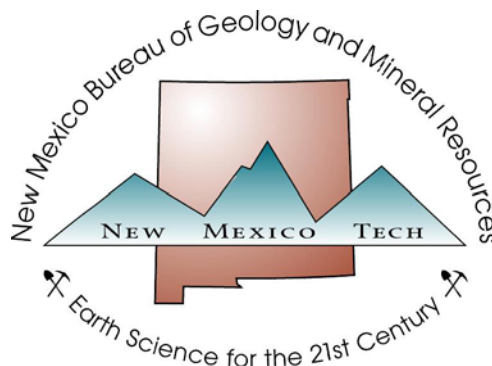


New Mexico Bureau of Geology and Mineral Resources

Inventory of Geological and Geophysical Data Collections

By

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New Mexico Bureau of Geology and Mineral Resources
A Division of New Mexico Institute of Mining and Technology
Socorro, NM 87801

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Introduction and Summary

The New Mexico Bureau of Geology and Mineral Resources, a division of the New Mexico Institute of Mining and Technology, serves as the state geological survey of New Mexico. Our extensive geological and geophysical data collections reside at our main office in Socorro, New Mexico on the campus of the New Mexico Institute of Mining and Technology. The New Mexico Bureau of Geology and Mineral Resources has seven full-time staff members and one part-time staff member that routinely that routinely put all or part of their work effort into maintaining and documenting our collections and into acquiring new materials for our collections. This amounts to 15 percent of our total staff, which includes administration, staff scientists and engineers, technicians, technical support staff, and secretarial staff. In addition student assistants that temporally vary in number from three to six are involved with organization, maintenance and documentation of our collections. Many activities pertaining to our collections (including organization and documentation of the collections, creating digital databases of our collections and populating those databases with metadata, and construction of new storage space for storage of physical samples) rely on external funding, which is often sporadic in receipt.

Our collections include: physical rock specimens/samples; geophysical well logs; analytical data collections; descriptive rock data; maps of oil and gas wells/fields, mines and maps of geological localities; and production data. Physical rock specimens/samples include: rock drill cores for oil, gas, mineral exploration coal, and geothermal drill holes; drill cuttings (principally for oil and gas wells); sidewall cores for oil and gas wells; rock specimens collected from outcrops in the field; mineral specimens; and fossils. Geophysical well log collections include those for oil and gas wells, uranium drill holes, and coal drill holes. Analytical data include: petrophysical analyses; petroleum source

rock analyses; coal quality data; geochronologic age dates; and analyses of New Mexico ground waters. Descriptive rock data include descriptions/logs of drill cuttings and drillers logs of oil and gas wells. Production data are for oil and gas, coal, and mined metals.

A portion of our collections is fully catalogued with developed digital catalogs containing significant metadata. Other collections have no catalogs, digital or paper. Yet other collections have partially developed digital catalogs with varying amounts and types of metadata.

Major challenges regarding our collections include construction of adequate physical space to store additional (future) donations of rock cores and drill cuttings, development and completion of digital databases (populated with metadata) for all of our collections, conversion of paper collections into digital format, and placement of digital collections into an internet-accessible environment.

State Geological Survey Information New Mexico Bureau of Geology and Mineral Resources

The New Mexico Bureau of Geology and Mineral Resources serves as the state geological survey of New Mexico. It is a division of the New Mexico Institute of Mining and Technology, a state-supported institution of higher education. The New Mexico Bureau of Geology and Mineral Resources was established in 1927 by an enabling act of the New Mexico State Legislature. Our main office is located on the campus of New Mexico Institute of Mining and Technology in Socorro. We have satellite offices in Albuquerque and Carlsbad, New Mexico. Geological and geophysical data collections reside at the main office in Socorro. Dr. Peter Scholle is the Director and State Geologist. His contact information is:

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The following individuals serve as contact points for specific types of collections:

1. Oil, natural gas, carbon dioxide, helium, uranium wells, geophysical well logs and data; general subsurface geological data:

Ron Broadhead
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2. Rock cores and drill cuttings:

Annabelle Lopez
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3. Coal, coal data, coal geophysical well logs:

Gretchen Hoffman
Senior Coal Geologist
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4. Uranium mines, uranium mining data:
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Senior Economic Geologist/Minerals Outreach Liason
New Mexico Bureau of Geology and Mineral Resources
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Tel: (575)-835-5521
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5. Mineral collections:
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Senior Mineralogist/Economic Geologist
New Mexico Bureau of Geology and Mineral Resources
801 Leroy Place
Socorro, NM 87801
Tel: (575)-835-5140
Fax: (575)-835-6333
Email: vlueth@nmt.edu

6. Mines, mine data, mine maps:
Bob Eveleth
Senior Mining Engineer
New Mexico Bureau of Geology and Mineral Resources
801 Leroy Place
Socorro, NM 87801
Tel: (575)-835-5325
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7. Geologic maps, geologic reports:
Maureen Wilks
Geological Librarian
New Mexico Bureau of Geology and Mineral Resources
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8. Ground water analyses, water quality data

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Strategic Plan for Geological and Geophysical Data Collections

The New Mexico Bureau of Geology and Mineral Resources does not have a comprehensive, written, long-term plan in place for its geological and geophysical data collections, although fragments of portions of such a plan reside with curators of our various collections. This plan will be developed during the last half of calendar year 2008 and the first half of calendar year 2009 and will include policies and procedures for the acquisition, preservation, and documentation of/access to geological and geophysical data collections.

Staffing and Budget

The following staff are actively involved with the care and management of collections. The approximate fractional effort of each person apportioned toward care and management of our collections is listed also.

Full-time staff

Amy Trivitt-Kracke, Petroleum Computer Specialist (full effort)
Annabelle Lopez, Petroleum Information Specialist (full effort)
Ron Broadhead, Principal Petroleum Geologist (1/4 effort)
Gretchen Hoffman, Senior Coal Geologist (1/4 effort)
Virgil Lueth, Senior Mineralogist/Economic Geologist (1/2 effort)
Bob Eveleth, Senior Mining Engineer (1/2 effort)
Virginia McLemore, Senior Economic Geologist (1/4 effort)

Part-time staff

Maureen Wilks, Geological Librarian (3/4 effort)

It is estimated that approximately 10 percent of our operating budget is applied toward care and management of our various geological and geophysical data collections. We rely on external funding to support collection-related activities, including funding from the NGGDPP, the U.S. Mine Safety Health Administration (MSHA), and the U.S. Office of Surface Mining (OSM). We rely on private sector funding for cataloging of uranium geophysical well logs and for the construction of core storage buildings, as state and federal funds are not available for these activities, nor have they been available for at least the last 15 years.

Major Expenditures during the Last Five Years

During the last five years, the New Mexico Bureau of Geology and Mineral Resources has expended staff time and financial resources for the acquisition, documentation, and preservation of its collections. Major efforts have been expended in the following areas:

1. Cataloging, inventorying and archiving of donated geophysical well logs in oil and natural gas wells;
2. Cataloging, inventorying and archiving of donated geophysical well logs in uranium exploration holes;
3. Cataloging, inventorying and archiving of donated geophysical well logs in coal exploration holes;
4. Cataloging, inventorying and archiving of rock drill cuttings from oil, natural gas, and water wells;
5. Cataloging, inventorying and archiving of oil, natural gas and mineral drill cores;
6. Cataloging, inventorying and archiving of subsurface paper records of geologic data, including oil and gas well records; old, rare or one-of-a-kind geologic maps and reports; theses/dissertations; mine and mineral property reports;
7. Organizing, cataloging, georeferencing, preserving and scanning historic coal mine maps;
8. Cataloging, inventorying and archiving mineral specimens.

These efforts have occupied approximately 10 percent of our operating budget. As mentioned above, some of the activities have been made possible only through the acquisition of external funding.

Current Status of New Mexico Bureau of Geology and Mineral Resources with regard to Geologic and Geophysical Data Collections

Current staffing levels are barely adequate to assimilate new data and samples into existing collections and to produce digital catalogs of data and metadata for selected collections. Data cataloging can only be accomplished for collections where data catalogs (whether digital or paper) currently exists. Even then, large donations of or acquisitions of data or rock cores, cuttings and samples may take several years to be fully integrated into our collections. New acquisitions for collections that are not currently cataloged are, in some cases, integrated into the collections in an orderly format that allows for on-site manual (i.e. paper) data searching and retrieving in organized files. In cases where the collections are not currently organized, new acquisitions of data and/or samples are added physically to our collections but are uncataloged and not physically organized; in these types of collections, samples and data cannot be searched, identified, and retrieved. Current external, private-sector funding makes it possible to physically organize geophysical well logs from uranium exploration drill holes and to construct a digital catalog of the well logs using student assistants; if this tenuous funding disappears, then organization and cataloging of these data will of necessity stop.

Most of our collections are stored in permanent structures that provide for secure and weatherproof rock cores, drill cuttings, and collections of paper data (Figures 1-5). Some collections, especially most of our rock samples collected in the field, are stored in trailers (converted mobile homes; Figure 6) that have either inadequate construction inadequate layout/geometry, inadequate ventilation, or inadequate lighting to allow for access to materials in a workable manner.

Storage space is perhaps our most serious concern. Currently our storage space for drill cuttings and rocks cores is more than 95 percent filled. As a result, we can only accept donations of small volumes of materials on a selective basis. We have been placed

in the position where we have had to refuse large donations of rock core unless those donations are accompanied by cash donations of sufficient size to permit construction of new storage buildings.

Within the last 15 years, we have constructed additional storage space for rock core in the form of low-maintenance, 30 ft x 100 ft insulated steel buildings (Figure 1) that are lit by skylights, which keeps the cost of construction and upkeep as low as possible. In our southwestern location, skylights adequately illuminate the interior of buildings during the daytime except during storms or extremely cloudy days. We have built these structures as funds for construction have become available. Current estimated construction cost is \$150,000 – 200,000 per building, up from \$70,000 just 10 years ago. Equipage with heavy duty steel shelving of sufficient strength to bear long-term loading of rock core will cost approximately \$20,000 per building. As state and federal funds are not available, funds for construction of new core storage buildings have been obtained from private-sector donations and buildings have been constructed as donated funds have become sufficient. Unfortunately, donations have tapered off sharply over the past decade and, at present, we have less than 10 percent of the funds that it would take to construct and equip a new storage building. In the past, most of our construction funds were obtained from donors of large volumes of rock core, but in the past decade prospective core donors have rejected requests to donate funds for building construction. At present donation levels, we do not expect to accumulate sufficient funding for construction of a new core storage building for at least 10 years.



Figure 1. Rock core collections are stored in 30 x 100 ft steel buildings.



Figure 2. Layout tables in core buildings allow visitors to view and examine core.



Figure 3. Rock drill cuttings are stored in a climate-controlled facility.



Figure 4. Geophysical well logs (oil and natural gas wells) are stored in accessible filing cabinets.



Figure 5. Geophysical well logs (uranium exploration drill holes) are stored in indexed cardboard boxes on shelves and must be removed to another location in order to be examined or copied. Insufficient space exists to store these along with logs from oil and gas wells and coal drill holes (stored yet in a third archival room).



Figure 6. Most of our field rock specimens are stored in converted mobile homes.

Preservation of Collections

Most of our collections are well stored and preserved. However, several collections of older paper (generally more than 50 years old) suffer from age-related deterioration of the paper. Although no such collections are yet in a critical state, these paper records need to be digitally scanned for long-term preservation. With one collection containing more than 200,000 pages of information hand typed on vintage onionskin paper, preservation by scanning will not be a trivial task and cannot be accomplished with current, in-house survey resources.

Documentation of Collections

We are in the long-term, process of developing digital catalogs of the data and information in our oil, gas, coal, uranium and mineral collections. We are approximately 75 percent completed with selected collections. For the most part, this work has been accomplished with existing staff and has been, therefore, sporadic with progress accomplished as work time and completion as other work tasks allow. Substantial additional work will be required for compliance and conversion of our digital catalogs with the National Data Catalog that is currently being developed under the NGGDPP. If NGGDPP funds are accessible during FY2008, then substantial conversion of existing digital data catalogs to NGGDPP format and input into the National Data Catalog can be accomplished. Completion of selected, major digital catalogs will also be possible. Without NGGDPP FY2008 funding, completion of selected digital data catalogs and conversion to NGGDPP format will not be possible. Documentation and metadata vary from collection to collection but will include mandated National Data Catalog elements such as location, sample/data type and, for subsurface data, depth and in many cases stratal unit (“formation”) as well as other information (providing NGGDPP funding becomes available in FY2008 and subsequent years).

Our collections are under the control of our survey and reside in secure facilities on survey/university property. Most of our collections are fully accessible and are accessible by external entities. Exceptions include collections such as outcrop rock samples that have not been physically organized and completely cataloged or cataloged

and small, recently acquired collections that remain confidential pending donor(s) approval for release.

Digital collections are available to external users. Exceptions include those digital collections that are not yet satisfied with quality assurance of data or digital images or in cases where digital conversion or imaging is only in its beginning phases.

Major Challenges Regarding Collections

There are four major challenges regarding our collections:

1. Construction of adequate physical space to securely store new donations of rock cores and drill cuttings in an accessible manner;
2. Development and completion of digital catalogs with physical metadata entries for all of our collections;
3. Conversion of all paper collections into digital format;
4. Placement of digital collections into an internet-accessible environment.

Probably the most pressing need is the construction of adequate physical space to securely store new donations of rock cores and drill cuttings in an accessible manner. Adequate space will allow us to continue to accept intermediate to large donations of cores and drill cuttings. Otherwise, we will have to selectively accept offers of donation of those materials and we will be limited to accepting donations of only small volumes of materials (our present policy).

Description of Collections

We have 46 documented, major collections at our state survey (Tables 1, 2). These include large collections of physical specimens such as rock core and rock drill cuttings to primary-types of analyses such as geophysical well logs, coal quality data and aerial photographs, to geologic and other types of maps to paper records of oil, gas, coal and uranium drill holes and mines to records of metal mining, coal and oil/gas production. Some of the collections are digitally cataloged and have metadata such as locations, depths and basic geologic information associated with them while other collections only have paper/card catalogs and other collections are wholly or partially

uncataloged. In general the collections that see more frequent use have a catalog (whether digital or paper/card) associated with them. Most smaller collections that see frequent use and are not cataloged are physically organized in such a manner that allows for on-site inspection and searching. Collections that see infrequent or little use tend to be uncataloged but may be partially organized or, in some case, may not be organized at all. The collections are not present at one central locality but are scattered throughout the various buildings that our survey occupies on the campus of New Mexico Institute of Mining and Technology.

Table 1. Summary of geological and geophysical data collections at New Mexico Bureau of Geology and Mineral Resources, grouped by type of materials in collection. Collections dominantly or wholly have New Mexico materials unless otherwise noted.

Types of materials in collections (number of collections)	Collection names
Rock samples and specimens (8 collections)	Rock cores Drill cuttings Rock core chips Sidewall cores Field rock specimens Mineral & gem specimens (New Mexico & national/world coverage) Meteorite specimens (New Mexico & national/world coverage) Fossils (New Mexico & national/world coverage)
Geophysical well log collections (3 collections)	Oil & gas well logs Uranium drill hole logs Coal drill hole logs
Primary analytical data collections (10 collections)	Petrophysical data Drill stem test records Petroleum source rock data Coalbed methane desorption data Coal quality data Geochronologic age dates New Mexico water quality data Chemical analyses of New Mexico waters Micropaleontologic age determinations
Collections of rock-descriptive data (3 collections)	Lithology logs of cuttings Drillers logs of oil & gas wells Drill cuttings descriptions

<p>Descriptions and maps of oil & gas wells fields and pools, mines and geological localities (16 collections)</p>	<p>Scout cards of oil & gas wells Midland Oil Scouts Association scout tickets Neil Wills scout tickets (oil & gas wells) Neil Wills data for oil & gas wells Oil & gas well history reports (detailed) Oil & gas pool maps R-orders (state regulatory orders) for oil & gas pools/fields Petroleum exploration maps Weekly reports of drilling progress for oil & gas wells Coal resource data Mineral locations Mines database Historical mine data Aerial photographs Maps of New Mexico Construction aggregate database</p>
<p>Oil, gas & mineral production data (4 collections)</p>	<p>Annual production reports oil and gas pools and wells in New Mexico Monthly oil, gas & water production reports for oil & gas pools and wells in New Mexico County coal production (New Mexico) Metal production data (New Mexico mines)</p>
<p>Historical and miscellaneous information (2 collections)</p>	<p>Historical photographs of New Mexico (mines & geology) County petroleum files</p>

Table 2. Major geological and geophysical data collections at New Mexico Bureau of Geology and Mineral Resources.

Collection name or brief description	Number of items/size of collection	Digital data catalog developed?	Brief description of collection
Rock cores	43,703 boxes 1,433 drill holes	Yes (under development)	Rock cores from oil & gas wells, uranium drill holes, mineral exploration drill holes, coal exploration drill holes, geothermal evaluation drill holes, water wells, and stratigraphic tests in New Mexico. Digital data catalog in Access/Excel format has entries for all drill holes but metadata entry is ongoing.
Rock core chips	135 wells, 280 boxes	Yes	Chips of rock core from oil & gas wells. These are stored in boxes and cataloged according to depth of core chip, well name, and well location. Samples represent 14,651 ft of core. Digital data catalog/metadata under development.
Sidewall cores	3296 sidewall cores from 124 oil & gas wells	Yes	Collection contains 3296 sidewall cores from 124 oil & gas wells drilled in New Mexico. Digital data catalog/metadata under development.
Rock drill cuttings	48,744 boxes 16,865 drill holes	Yes (under development)	Rock drill cuttings primarily from oil & gas wells but also from uranium & mineral exploration drill holes, water wells, coal exploration drill holes, and geothermal exploration drill holes. Digital data catalog in Access/Excel formats has entries for all drill holes but metadata entry is ongoing.
Field rock specimens	6500++	Partial	Rock samples collected in field from numerous counties in New Mexico. 6438 samples collected

			after 1996; unknown number of samples collected prior to 1996. Partially catalogued in several paper and digital databases. Metadata content of databases is variable.
Mineral & gem specimens	18222	Yes	Mineral specimens in survey's mineral museum. The digital catalog in Access format and card catalog are not public information. New Mexico & national/worldwide coverage.
Meteorite specimens	100	Yes	Meteorite specimens in survey's mineral museum. The digital catalog in Access format is not public information. New Mexico & national/worldwide coverage.
Fossil specimens	1500	Yes	Fossil specimens in survey's mineral museum. The digital catalog in Access format is not public information. New Mexico & national/worldwide coverage.
Oil & gas well logs	88,310 logs 49,757 drill holes	Yes (under development)	Paper copies of oil and gas geophysical well logs, including electrical logs, radioactivity logs, sonic logs, porosity logs and in some cases mudlogs and dipmeter logs. 6572 well logs have been scanned as tiff images. Digital data catalog in Access format is 70 percent complete and metadata entry is ongoing.
Uranium drill hole logs	14,210 drill holes	Yes (under development)	Paper copies of geophysical well logs from uranium exploration drill holes, mostly from the southern flank of the San Juan Basin. Digital data catalog (Access format) and archiving/inventorying is 60 percent complete; digital catalog is populated with

			limited metadata.
Coal drill hole logs	5,040 drill holes	Yes	Geophysical well logs from coal exploration and development drill holes and uranium drill holes in coalfield areas. Digital data catalog with limited metadata.
Petrophysical data (porosity & permeability analyses of rock cores)	3,992 measurements	No	Porosity and permeability measurements made on rock cores from oil & gas wells, organized by section, township, range and by well. Paper records.
Drill stem tests	227 tests	No	Drill stem test records from oil & gas wells, organized by section, township, range and by well. Paper records.
Petroleum source rock analyses	175 wells (est.), 3300 analyses (est.)	Partial	Petroleum source rock analyses made on drill cuttings, rock cores, and outcrops in New Mexico. Most in digital or scanned format in various topical reports/digital databases. Others are in paper format and not yet available. Also comprehensive Access database available for source rock data acquired prior to 1998.
Coalbed methane desorption data	31 wells	No	Coalbed methane desorption data from 31 wells/samples in Raton Basin of New Mexico. Paper records.
Micropaleontologic age determinations made from rock cuttings	285 wells	No	Micropaleontologic age determinations made on 285 oil and gas wells in New Mexico. Paper records of determinations/analyses made on drill cuttings.
Geochronologic age dates	3500	Yes	Geochronologic age dates of New Mexico rocks. Digital database available.
Coal quality data	720	No	Coal quality data for New Mexico coals, obtained from a variety of published and unpublished sources. In several Access databases.

Coal resource data	4433	No	Coal resource data from a variety of published and unpublished sources, including tops and bases of coal beds in wells, coal thickness, and depth to coal-bearing formations. In several Access databases.
Chemical analyses of New Mexico waters	52000 data entries	No	Analyses of New Mexico waters, including pH, alkalinity, conductivity measurements
New Mexico water quality data	433	Yes	Chemical analyses of waters obtained from water wells.
Lithology logs of cuttings descriptions	6,024 drill holes	No	Graphical strip logs of cuttings descriptions from 6,024 oil and gas wells in New Mexico.
Drillers logs of oil & gas wells	15,824 wells	No	Drillers' log descriptions of 15,284 oil and gas wells in New Mexico. Paper records. Many unique.
Oil & gas well history reports (detailed)	191 wells	No	Detailed drilling testing and completion histories of 191 oil and gas wells in New Mexico. Paper records.
Drill cuttings descriptions	1000 (est.)	No	Written descriptions of drill hole cuttings in paper format.
Scout cards for oil & gas wells (various sources)	106,566 wells, 141,651 pages	No	Scout cards on oil and gas wells in New Mexico, from a variety of sources. Many are original, one-of-a-kind records, especially for older wells.
Midland Oil Scouts Association Scout Tickets	22,272 wells, 32,460 pages	No	Collection of scout tickets provided by the Midland Oil Scouts Association for oil and gas wells in southeastern New Mexico.
Neil Wills Scout Tickets on oil & gas wells	18,125 wells, 20,445 pages	No	Handwritten scout tickets on oil and gas wells in New Mexico. Unique collection of original paper donated by late geologist Neil Wills.
Neil Wills data on oil & gas wells	517 wells, 5687 pages	No	Various types of data on oil and gas wells in New Mexico in paper format. Donated by late geologist Neil Wills.
Oil and gas pool	43	No	Maps showing boundaries of

maps			New Mexico oil and gas pools. In paper format and available as ARC/GIS files.
Petroleum exploration maps	26 maps for 26 counties	No	Mylar copies showing locations of oil & gas exploration and development wells drilled in 26 New Mexico counties on a section-township-range grid. Continuously updated. Paper copies available for a nominal fee.
Weekly reports of drilling progress for oil & gas wells, dating from 1931	228,895 pages	No	Detailed weekly reports of drilling progress and drilling activity of individual oil and gas wells drilled in New Mexico dating from 1931. Earlier reports (1961-1963) are onionskin carbon copies and are believed to be the last surviving copies. This collection contains a significant amount of information/data that was never transferred to scout cards and scout tickets. Very useful information for old well reentries and for environmental mitigation in old wells.
Annual/monthly production reports of oil and gas pools and wells in New Mexico	57 volumes	No	Annual reports of the New Mexico Oil and Gas Engineering Committee listing oil and gas production by pool and by well, both annually and by month. Paper records.
Monthly oil, gas & water production reports and injection volume reports for oil & gas wells in New Mexico	1,452,000 pages	No	Monthly reports of the New Mexico Oil and Gas Engineering Committee listing oil and gas production volumes by pool and by well, by month and number of days each well produced during each month. Paper records.
Regulatory orders for New Mexico oil & gas pools/fields	61 volumes	Yes	State compliance and oil & gas pool creation and expansion orders for 2290 oil and gas pools in New Mexico.

			Maintained in both digital and paper format.
County coal production	unknown	Yes	Coal production data for New Mexico counties from 1889 to present. Individual mine production given where available. In Excel format.
Metal production data	unknown	No	Incomplete data catalog/database of most metal production data associated with New Mexico mines. Identified by county, district and, in some cases, by individual mine.
Mines database	7625	Yes	7625 records of New Mexico mines
Historical mine data	100,000 pages	No	7 filing cabinets that contain data and maps associated with mines in new Mexico.
Mineral locations	333	No	Data on 333 mineral localities in New Mexico
Historic mine archives collection	8000	Yes	8000 historical data records on mines in New Mexico.
Aerial photographs	unknown	No	Vintage aerial photographs of various parts of New Mexico. Stored in filing cabinets and organized by geologic quadrangle.
Maps of New Mexico	2782	Yes	Geological, hydrological, geophysical and mining maps of New Mexico and adjacent states.
Construction aggregate	2778	Yes	2778 data entries on construction aggregates located on New Mexico State Trust Lands
Historic photographs of New Mexico	5400	Yes	5400 historic photographs related to mining and geology in New Mexico.
County petroleum files	650	No	These paper files, organized by county, contain descriptions of oil gas & water wells, measured stratigraphic sections and columns, miscellaneous maps and geologic and resource reports for wells and areas in New Mexico. Uncataloged.

